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(51) INT CL<sup>5</sup>

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(52) UK CL (Edition K)

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**B3F FCC F224 F526**

(56) Documents cited

**GB 1351354 A**

**GB 1252925 A**

**GB 1126818 A**

**GB 1005313 A**

**US 4501413 A**

(58) Field of search

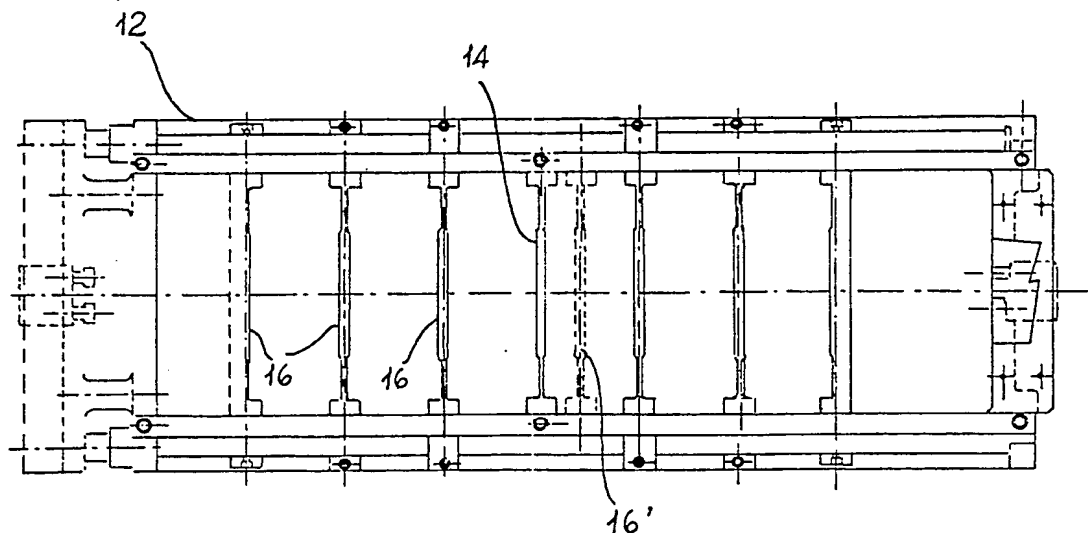
**UK CL (Edition K) B3F FCC, H1B**

**INT CL<sup>5</sup> B22D, H01M**

**Online databases : WPI**

(54) **Device for making packages of mutually insulated battery plates for further processing, e.g. moulding connections thereon, and thereafter automatic boxing**

(57) The device consists of one or more boxes 12 for the preliminary compacting of packages of plates prior to further processing each box having a plurality of moving internal walls which are made to draw toward the fixed central wall 14 starting from opposing fronts, there being on both faces of said walls elastic, independently inflatable and/or deflatable membranes 26 having the purpose of compacting the groups of plates and releasing them simultaneously or individually or alternately at the moment (Fig. 2 not shown) they are pushed into the battery container 36 after further processing by suitable members 32 present at a station 30 capable of vertical movement and rotation of the battery container. Creation of connection bonds by casting, using dies divided into two sectors brought together and independently fed with lead melted at different temperatures for the connection of positive plates and the thinner negative plates respectively can be used since the device facilitates assembly of a uniform alternation of positive and negative groups of plates in the battery container.



**FIG. 1**

**GB 2 251 975 A**

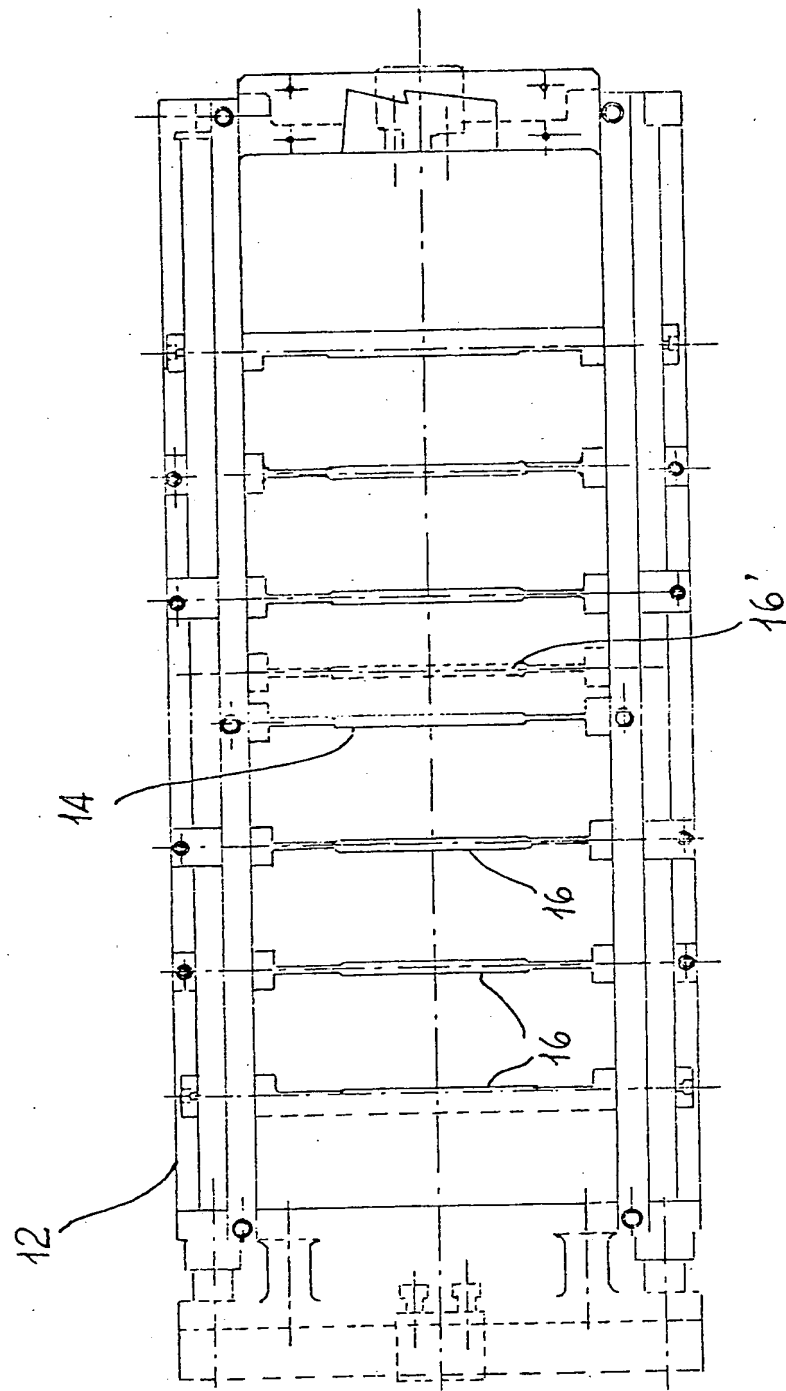


FIG. 1

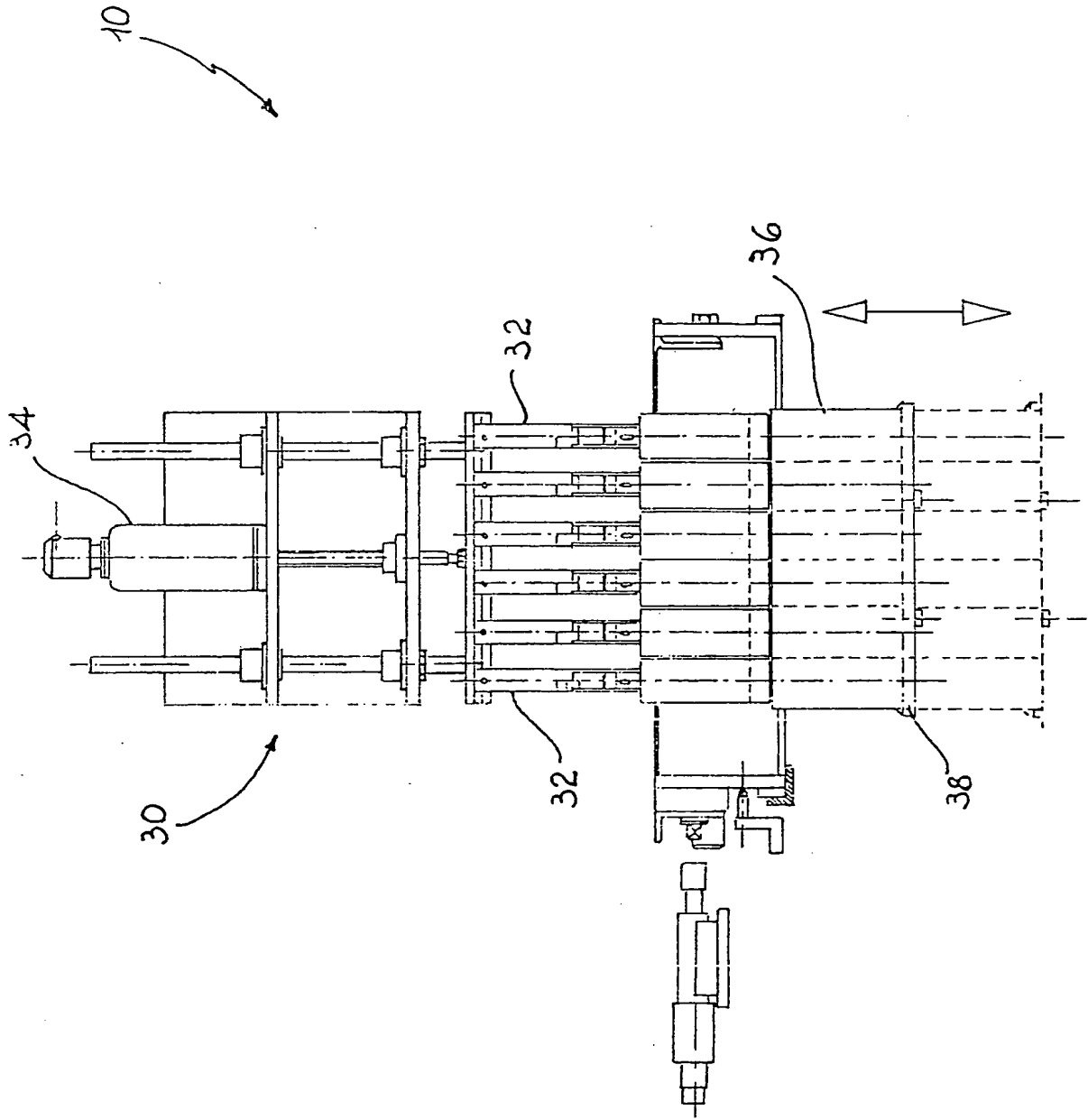


FIG. 2

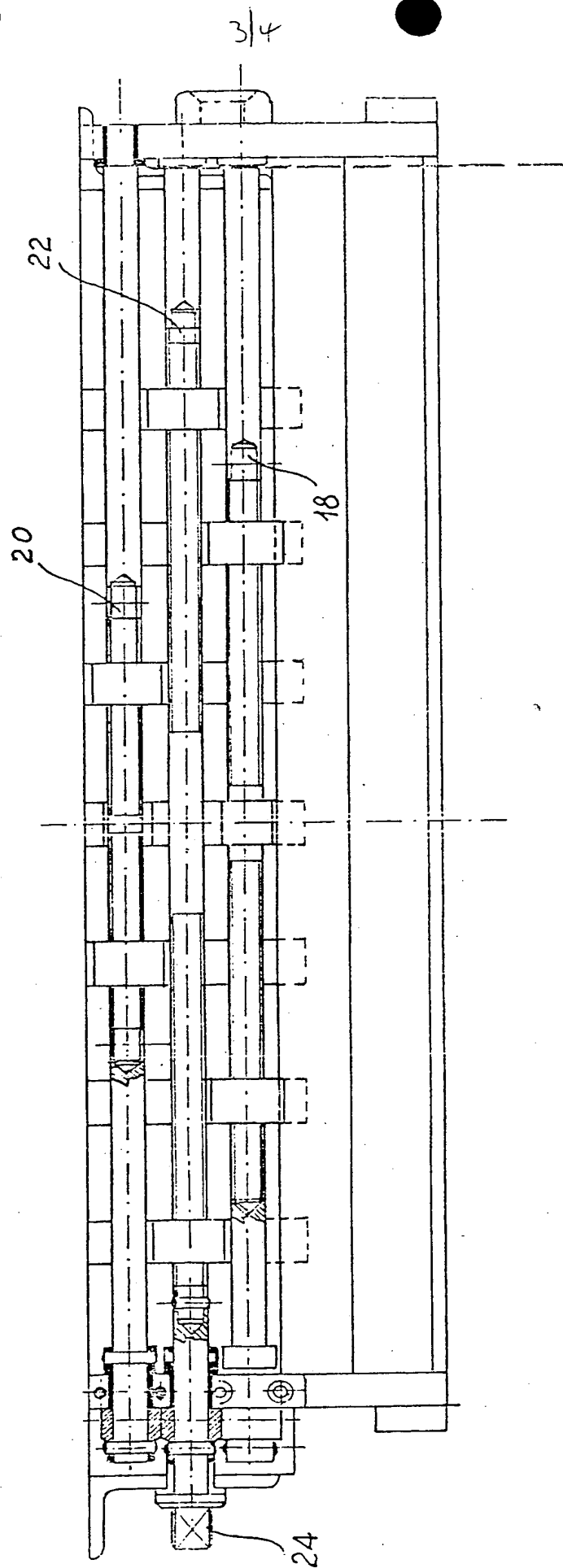


FIG. 3

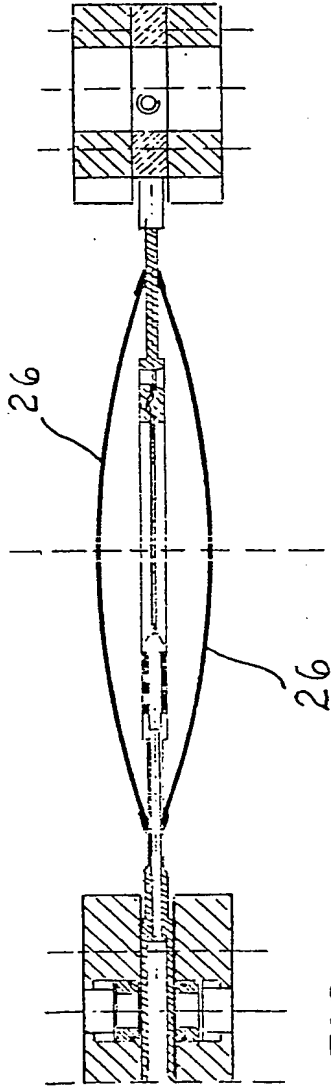


FIG. 4

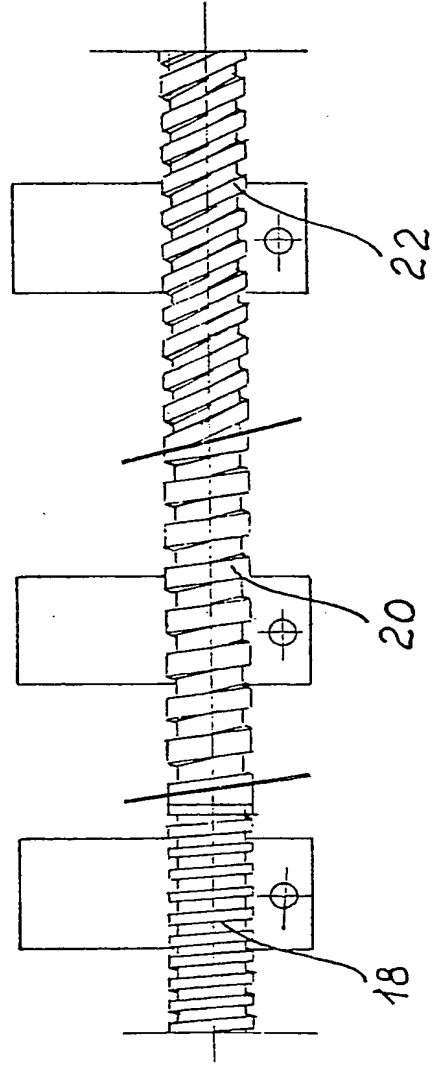


FIG. 5

-1-

"Device for making packages of mutually insulated battery plates and the automatic boxing thereof"

\* \* \* \* \*

## DESCRIPTION

5           The present invention relates to a device for making packages of mutually insulated battery plates and the automatic boxing thereof.

Apparatuses for the production of current based on a reversible electrochemical reaction are conventionally known under the name batteries or electric batteries or secondary cells and are used in a broad range of industries including the auto industry for starting motors. The most common acceptance classifies said apparatuses as batteries, it being understood that the term indicates a multiplicity of individual or interconnected electric cells. The secondary cells consisting of a series of reversible electric elements are used as continuous current generators where there are required, for example, numerous discharge/charge cycles in the case of industrial batteries and/or repeated intense currents as in automobiles.

10  
15  
20

In these cases the batteries are of the lead-acid type, so defined because the electrolyte is acid and the electrodes or plates are of lead alloy.

25           The device which is the subject matter of the present invention falls within the broader cycle for the creation of packages of plates and comprises in particular operations of alignment of the plates in special boxes, overturning of said boxes, brushing and deoxidizing of the fins or lugs, drying, and connection

30

of the latter by addition of melted lead to create a bond. The plate packages achieved are then lowered into cells of the container. The device is usable for the production of gas recombination batteries or starting  
5 batteries and has the purpose of allowing during assembly rapid and easy insertion of the packages of positive and negative plates in the cells of the battery container.

In the case of casting of the positive and negative bonds at differentiated temperature, the present  
10 invention overcomes the drawback connected with the fact that said groups of plates appear originally uniformly aligned as to polarity while arrangement with alternate polarity is required in the battery.

Indeed, it is known that the positive plates are  
15 in general considerably thicker than the negative plates and therefore require that the corresponding projecting fins or lugs required for creation of the above mentioned connection bonds are immersed in dies made of lead melted at different temperatures.

20 Said dies of course can also be divided in two sectors brought together and independently fed to obtain, as required, differentiated temperature, but the different lugs of the immersed plates in each of them must obligatorily have the same thickness and hence  
25 polarity. After the operation there will thus appear on one side a group of plates connected together, in this case with positive polarity and considerable thickness, while on the other side of the die there will be a corresponding group of plates with negative polarity and  
30 thinner than the others. During assembly as already

mentioned, uniform alternation will be required in the battery cell of groups of plates with positive or negative polarity.

These and other objects are achieved by the device in accordance with the present invention which comprises at least one box for insertion and preliminary compacting therein of the plates and of the conventional separators and a vertical rotating movement unit for the container of the battery and is characterized basically in that the box has a multiplicity of moving internal walls designed to draw near to the central fixed wall starting from opposite fronts under the effect of rotating threaded bars and each having a different pitch, there being present on both fronts of said walls elastic membranes independently inflatable with pressurized fluid capable of compacting the groups of plates and releasing them simultaneously or individually or alternately.

To further clarify the explanation of the innovative principles of the present invention and its advantages as compared with the known art there is described below with the aid of the annexed drawings a preferred and non-limiting embodiment by way of example applying said principles. In the drawings -

FIG. 1 shows schematically a plan view of the box assembly,

FIG. 2 shows an overall view of the device with members for descent of the plates and movement of the container with the cells,

FIG. 3 shows a partially sectioned schematic side view to show the threaded bars with different pitch



present in the tank,

FIG. 4 shows a schematic view of one of the walls provided with elastic membranes, and

FIG. 5 shows a schematic side view of the threaded  
5 bars having different pitches.

With reference to the figures the device,  
indicated by 10 in FIG. 2, is basically made up of a box  
12, formed and dimensioned in any manner, inside which  
are provided some separating walls. Said walls have the  
purpose of drawing together in a package the multiple  
10 plates preliminarily inserted in the box 12 and therefore  
moving, except for the central one indicated by 14. The  
remaining walls 16 under the effect of suitable members  
which will be described below, are moved from two  
15 opposite fronts of the box and made to draw near in a  
predetermined and calibrated manner to the fixed central  
wall 14.

The purpose of said movement is to compact said  
plates and arrange them for the uniting operation which,  
20 as known, consists of connecting the lugs with which each  
individual plate is provided by immersion in molten lead  
which leads to the creation of the bond. To achieve  
progressive approach to the central wall 14 of remaining  
walls 16 there are advantageously used threaded bars with  
25 different pitch, the travel for each plate also being  
different. In FIG. 1, indicated by 16' in broken lines,  
there is illustrated by way of example one of the walls,  
in this case the one on the right front nearest the fixed  
central wall 14, after completion of travel.

30 Said travel, as may be seen, is substantially

limited but the other walls have to complete greater travel during compacting of the plates to create the packages with uniform thickness.

FIG. 5 illustrates schematically the threaded bars with different pitch which are represented in greater detail in FIG. 3 in which it may be seen that said threaded bars, indicated by 18, 20 and 22, are arranged on the structure in such a manner as to be adjacent to each other and hence advantageously activatable for clockwise and/or counter-clockwise rotation by the only member 24 optionally provided with an encoder or a torque gauge in order to obtain precise and calibrated compaction of the plates.

This result is achieved thanks also to another peculiarity which relates to the structure of the separating walls; each of them is provided with opposing and independent elastic membranes, inflatable for example with air, which on the one hand allow recovery of any dimensional tolerances of the groups of plates while on the other hand they constitute the members which retain and release the plate packages created upon loading into the cell container as explained below.

Each wall 16 or 14 is thus provided with membranes 26 as shown schematically in FIG. 4 and provided in elastic plastic material and constrained to the walls along the entire periphery preferably by using cements and with flange.

During compacting of the plate groups, preliminarily or later upon contact between said plates and the walls 14 and 16, in the membranes 26 there is let

in fluid under adjustable pressure in such a manner that they swell moderately and compact uniformly the plates as they meet them.

5 The box 12 under these conditions is ready to be sent to the next operation, which calls for overturning and immersion in molten lead of the plate lugs to create the connecting bond.

10 As mentioned above, the elastic membranes perform another basic function, allowing automatic boxing of the plate groups after creation of the connecting bonds.

15 Since said bonds are achieved advantageously although not critically in a die with two aligned segments with different temperatures of the molten lead, i.e. depending on the different thickness of the elements mentioned, it is necessary to insert said groups in the containers in an alternating manner as regards polarity. Therefore, in accordance with the present invention, the device also comprises a station, indicated as a whole by 30 in FIG. 2, which intervenes on the box 12, again  
20 overturned after creation of the bonds. The station 30 comprises a plurality of moving members 32 which can be moved vertically individually or in groups or simultaneously. In the case represented in FIG. 2 said members are moved simultaneously by the compressed air  
25 cylinder 34 but it is clear that they could be lowered and raised independently or in alternating groups. The members 32 are designed to intervene on the plate groups formed and held between the walls 14 and 16 by the membranes 26 in such a manner as to push the groups into  
30 the container 36 arranged beneath the box 12. The

alternating deflation of the membranes 26 thus allows movement, even individually, of the plate groups. An advantageous solution provides that they be first freed, e.g. in uneven groups, that is the first, third and fifth, and placed in the container 36 by the corresponding pushing members 32. Immediately afterward the support 38 bearing said container is lowered by known means not described in detail, rotated on the plane 180° and raised so as to receive the second group of plates after deflation of the corresponding membranes present on the walls 14 and/or 16.

In this manner, with completely automated operations, boxing is completed in the container 36 of the plate groups alternated as to polarity.

It is noted that inflation and deflation of said membranes takes place starting from two tanks containing fluid under pressure present on the box with moving walls. The related supply ducts are preferably independent so that it is possible to deflate the membranes with equally independent operations and free the corresponding plate groups to be inserted in the container. The inflation and deflation operations can be performed manually by operating suitable valves present on the ducts or with automatic operations controlled by a control unit with pneumatic logic.

The tanks present on the box constitute a reserve of air which maintains the required pressure in the membranes up to the moment they are to be deflated to release the plate groups.

As may be seen from the foregoing the multiple

advantages of the present invention are evident. The plate groups are connected by a lead bond in a die advantageously in two segments with differentiated temperature in accordance with a fast and reliable automatic process, especially in relation to the precise and calibrated compacting of the plate packages. By a similar automatic procedure the plate groups are arranged in the container. Particularly advantageous is the adoption of the threaded bars with different pitch for drawing the walls together as well as that of the independently inflatable and deflatable membranes which carry out their function both during grouping of the plates and during alternating insertion thereof in the containers.

The invention as described above and claimed below has been proposed merely by way of example, it being intended that it may be subject to modifications and variations all falling within the scope of the inventive concept.

For example, the walls inside the box can be moved by other methods, for example compressed air. The system of fixing the elastic membranes to the walls could also be different from the proposal. It is intended finally that the unit providing boxing of the plates and provided with multiple pushing members designed to drop them into the container, can be used also if the plates are already alternated as regards polarity. In this case said plates, in a block or in different sequences, are dropped into said container.

CLAIMS

1. Device for obtaining packages of mutually insulated plates for batteries and the boxing thereof and comprising one or more boxes for the preliminary  
5 compacting of the plate groups and a unit for vertical movement and rotation of the battery container and characterized in that the boxes (12) have a plurality of moving internal walls (16) designed to approach, starting from opposite fronts, the fixed central wall (14) under  
10 the effect of threaded bars (18), (20), (22) having different pitches and rotated on both fronts of said walls, there being present elastic membranes (26) independently inflatable with pressurized fluid designed to compact the plate groups and release them  
15 simultaneously, individually or in alternating groups.

2. Device in accordance with claim 1 characterized in that the threaded bars (18), (20), (22) which move the moving walls (16) are rotated clockwise and/or counter-clockwise by a single motor member (24) optionally  
20 provided with an encoder or torque gauge.

3. Device in accordance with the above claims characterized in that the vertical movement and rotating unit for the battery container comprises members (32) which intervene simultaneously or alternately on the  
25 plate groups present in the boxes (12) and held between the membranes (26) after simultaneous or alternate deflation of said membranes.

4. Device in accordance with the above claims characterized in that each box (12) is provided with at  
30 least one tank containing fluid under pressure with

independent feed ducts for the membranes (26) inflated and deflated simultaneously or alternately by manual intervention or in accordance with automatic procedures controlled by a control unit with compressed air logic.

5        5. Device in accordance with the above claims characterized in that the members (32) are moved vertically and push simultaneously or alternately the plate groups into the container (36) born by the support (38) and arranged beneath and opposite the box (12).

10       6. Device in accordance with the above claims characterized in that the support (38) bearing the container (36) is movable vertically and rotates 180° in the plane clockwise or counter-clockwise.

15       7. Device in accordance with the above claims characterized in that the members (32) are moved vertically by compressed air cylinders or equivalent systems.

20       8. Device in accordance with the above claims characterized in that the support (38) is moved vertically and rotated by compressed air cylinders or equivalent systems.

9. Device for obtaining packages of mutually insulated plates for batteries and the boxing thereof substantially as herein described with reference to the accompanying drawings.

**Patents Act 1977**  
**Examiner's report to the Comptroller under**  
**Section 17 (The Search Report)**

Application number

9121620.0

**Relevant Technical fields**

(i) UK CI (Edition K ) H1B; B3F (FCC)

(ii) Int CI (Edition 5 ) H01M; B22D

**Databases (see over)**

(i) UK Patent Office

(ii) ONLINE DATABASES: WPI

Search Examiner

M J INSLEY

Date of Search

7 NOVEMBER 1991

Documents considered relevant following a search in respect of claims

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	GB 1351354 (VARTA) See Claim 1 and Figure 5A	
A	GB 1252925 (ELECTRIC POWER STORAGE) See whole document	
A	GB 1126818 (MAC. ENG.) See Claim 1	
A	GB 1005313 (GLOBE-UNION) See page 3 line 64 - page 5 line 79	
A	US 4501413 (VARTA) See whole document	



Category	Identity of document and relevant passages	Relevant to claim(s)

### Categories of documents

**X:** Document indicating lack of novelty or of inventive step.

**Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category.

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**P:** Document published on or after the declared priority date but before the filing date of the present application.

**E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.

**&:** Member of the same patent family, corresponding document.

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